

ABSTRACT

The present invention provides a recombinant nucleic acid comprising: a first nucleic acid sequence encoding a 5' alphavirus replication recognition sequence; at least one second nucleic acid sequence encoding an alphavirus nonstructural protein; at least one alphavirus subgenomic promoter; at least one IRES element; at least one heterologous nucleic acid; and a third nucleic acid encoding a 3' alphavirus replication recognition sequence. Further provided are methods of making alphavirus particles comprising a recombinant nucleic acid of this invention and methods of using the compositions of this invention. Also provided is a recombinant helper nucleic acid comprising: a first nucleic acid sequence encoding a 5' alphavirus replication recognition sequence; an alphavirus subgenomic promoter; an IRES element; a second nucleic acid encoding an alphavirus structural protein; and a third nucleic acid encoding a 3' alphavirus replication recognition sequence.